DRAFT
FIELD SAMPLING PLAN

BLADES GROUNDWATER
TOWN OF BLADES, SUSSEX COUNTY
DELAWARE

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BLADES, SUSSEX COUNTY, DELAWARE

Approved by: Ex. 4 CBI — 9-14-2018

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AST	aboveground storage tank
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
DAS	Delivery of Analytical Services
DI	deionized
DNREC	Delaware Department of Natural Resources and Environmental Control
DPT	direct push technology
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
EPCRA	Emergency Planning and Community-Right-to-Know Act
ERT	Emergency Response Team
ESAT	Environmental Services Assistance Team
FRB	field reagent blank
FSP	Field Sampling Plan
GPS	Global Positioning System
HAL	Health Advisory Level
HDPE	high-density polyethylene
HRS	Hazardous Ranking System
HSA	hollow stem auger
HSCA	Hazardous Substance Cleanup Act
IATA	International Air Transport Association
IDW	investigation-derived waste
LDPE	low-density polyethylene
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
MS/MSD	matrix spike and matrix spike duplicate
NFA	No Further Action
NPL	National Priorities List
OASQA	Office of Analytical Services and Quality Assurance Branch

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

ODW	Office of Drinking Water
OLEM	Office of Land and Emergency Management
OSWER	Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDF	Portable Document Format
PFAS	polyfluoroalkyl substance
PFBS	perfluorobutanesulfonic acid
PFC	perfluorinated compounds
PFHpA	perfluoroheptanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
ppb	parts per billion
PPE	personal protective equipment
ppt	parts per trillion
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
RBC	risk-based criteria
RI	Remedial Investigation
S/D	matrix spike/duplicate
SI	Site Investigation
SOP	Standard Operating Procedure
SOW	Statement of Work
START	Superfund Technical Assistance and Response Team
SVOC	semivolatile organic compounds
TAL	Target Analyte List

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

TPH	total petroleum hydrocarbon
UFP-QAPP	Uniform Federal Policy – Quality Assurance Project Plan
URS	Uniform Risk Standards
UST	underground storage tank
VOC	volatile organic compound
WAM	Work Assignment Manager
WESTON®	Weston Solutions, Inc.
XRF	X-ray fluorescence

1.0 INTRODUCTION

Under the Eastern Area Superfund Technical Assessment and Response Team (START) Contract No. EP-S3-15-02, Technical Direction Document No. W503-18-04-001, the U.S. Environmental Protection Agency (EPA) Region III tasked Weston Solutions, Inc. (WESTON®) to collect groundwater and surface water samples at the Blades Groundwater Site (the Site) located in Blades, Sussex County, Delaware. The Site consists of a contaminated groundwater plume potentially attributable to contamination associated with the Procino Plating facility and the Peninsula Plating facility, both located in Blades, Delaware.

2.0 BACKGROUND

This section provides a description of the site location and a summary of previous investigation activities associated with the Site.

2.1 SITE LOCATION AND DESCPRIPTION

The Site consists of the Town of Blades, Delaware (Blades). Blades is located in western Sussex County and covers approximately 0.5 square mile. Blades lies between the Nanticoke River to the north and Morgan Branch to the south (Figure 1). The Site is located in the Atlantic Coastal Plain Province and is situated on Nanticoke fluvial deposits. The Pliocene-aged Beaverdam Formation underlies the surficial deposits. Depth to water in the Blades area is typically less than approximately 10 feet below ground surface (bgs) (DNREC, 2010).

Within the Blades Site are Procino Plating, an active metal plating facility, and the location of the former Peninsula Plating facility, currently vacant land. The locations of Procino Plating and former Peninsula Plating are shown on Figure 2.

Procino Plating is located at 901 Market Street in Blades, Delaware. The Procino Plating facility property consists of 1.16 acres with generally flat topography and is surrounded primarily by residential properties. The facility has been an electroplating facility since the 1980s and has been operated as Procino Plating since 1996. Current operations at the facility consist of cutting and chrome plating griddle tops for restaurant use. Public water and sewer services are supplied to the facility by the Town

of Blades, but residences located beyond a railroad track west of the facility are beyond town limits and are supplied with water by residential wells (DNREC, 2010).

The former Peninsula Plating facility is located at the intersection of East 7th Street and River Road in Blades, Delaware, and encompasses approximately 5.8 acres. The property formerly had six warehouse and storage buildings that were historically used for metal plating, vending, trash hauling operations, steel products, and bread distribution (DNREC, 1999). There are currently no structures remaining on the property.

2.2 PREVIOUS INVESTIGATIONS

The Delaware Department of Natural Resources and Environmental Control (DNREC) has conducted investigations at both the Procino Plating Facilities and the Peninsula Plating facilities.

2.2.1 PROCINO PLATING

In 2010, DNREC performed a Preliminary Assessment (PA) in cooperation with the EPA. In the PA, DNREC recommended a Site Investigation (SI) due to chemical use and the potential to impact soil and groundwater (DNREC, 2010). DNREC performed the SI activities in coordination with the Delaware Division of Public Health Office of Drinking Water (ODW) in 2010 and 2011. The SI included sampling any registered/permitted private water supply wells within the Town of Blades limits. Water samples from outdoor spigots of residential homes were taken at each registered, accessible private well. Twelve private water supply wells were sampled surrounding the facility. Additionally, 26 soil samples were collected from 13 soil borings, and 6 groundwater monitoring wells were installed and sampled (DNREC, 2011).

Results indicated that dieldrin and heptachlor epoxide were detected at levels exceeding EPA's Maximum Contaminant Levels (MCLs). Chromium was detected in one well at a concentration approximately 10 times the EPA MCL. Nickel was detected but was below EPA screening levels. Both iron and manganese were detected but not considered a concern due to background levels and the lack of health effects.

Cyanide was detected in one off-site drinking water well from a depth of between 43 and 48 feet bgs. Because cyanide-containing solutions are commonly used in plating operations and a polyethylene tank

was noted on the property with the words "Cyanide Treatment 2" stenciled on the side, the presence of cyanide in the private well sample raised concern for an undetected release of cyanide from the Procino Plating facility (DNREC, 2011). Therefore, in 2011, DNREC recommended further evaluation of groundwater below a depth of 20 feet. It was also recommended that additional private water supply wells be tested and analyzed for the presence of total metals and cyanide (DNREC, 2011). Procino Plating entered into a Voluntary Cleanup Program agreement with DNREC in 2011 (Ten Bears, 2015).

From 2012 through 2015, Ten Bears Environmental (Ten Bears) performed Remedial Investigation (RI) activities on behalf of Procino Plating to characterize subsurface stratigraphy, determine groundwater elevations and groundwater flow direction, determine the extent and magnitude of contamination, and assess potential human health. Twelve new groundwater monitoring wells were installed and sampled during the RI. The RI also included sub-slab soil sampling within the Procino Plating facility.

In the RI, it was concluded that groundwater flow direction in the water table aquifer beneath the Procino Plating facility is to the south-southwest and that a fine-grained silt or clay layer was present beneath the facility at depths ranging from 22.5 to 27 feet bgs. A deeper clay layer was also encountered at depths ranging from 42.2 to 46 feet bgs.

In the RI, it was also concluded that dieldrin detected in previous investigations was a background contaminant from an upgradient source. The chromium concentration in groundwater from on-facility well MW-6 was confirmed to be approximately 10 times the drinking water MCL in a groundwater sample collected in May 2012. However, the chromium concentrations had decreased significantly approximately one year later in 2013 (from 1,170 parts per billion [ppb] to 319 ppb). Downgradient groundwater monitoring well MW-10 had a chromium concentration of 193 ppb in 2013, exceeding the MCL. Chromium concentrations in groundwater samples collected from other wells east, south, and west were below MCL or non-detect. Furthermore, chromium concentrations detected in deeper wells co-located with shallow wells MW-8 and MW-9 that are screened below the clay layer described above, were below MCL or non-detect. The RI indicated that the human health exposure pathway was incomplete.

In 2015, an interim removal action was completed by Ten Bears performed on behalf of Procino Plating that consisted of removing a portion of the facility's concrete slab floor, collecting soil samples for the purpose of delineating chromium concentrations to below the DNREC total chromium soil screening level of 214 milligrams per kilogram (mg/kg), and removing impacted soil with a mini-excavator. Approximately 20 cubic yards of soil were removed. A polyvinyl chloride (PVC) piping system was also installed to facilitate potential future remedial injections (Ten Bears, 2015).

In 2016, EPA observed several small drums of Fumetrol 140, as indicated in the site photographs presented in the Procino Plating SI report. The chemical is known to have perfluoroalkyl substances (PFAS) as a component. The chemical is used a "wetting agent" and a surface water stabilizer during the electroplating process (EPA, 2018).

2.2.2 PENINSULA PLATING

The former Peninsula Plating facility is located approximately 0.5 mile north of Procino Plating. In 1992, a Phase I Audit was performed at Peninsula Plating. Observations from the Phase I Audit included drums of propylene glycol and mineral spirits, a 2,000-gallon diesel underground storage tank (UST), and a 275-gallon waste oil UST. Stained soil was observed around the USTs. The waste oil UST was removed in November 1992. Although low-level total petroleum hydrocarbon (TPH) impacts were detected at the time of the removal, the UST was issued a letter of No Further Action (NFA). The closure report for the 275-gallon UST also noted the presence of a 1,000-gallon heating oil aboveground storage tank (AST), a 2,000-gallon diesel AST, and a 1,000-gallon gasoline AST. A Phase II assessment conducted in 1993 included soil samples collected from the stained areas around the former USTs (DNREC, 1999).

In spring 1995, the DNREC Hazardous Waste Management Branch conducted a site visit at the Peninsula Plating facility. DNREC noted plating process chemicals, including nickel sulfate, sulfuric acid, chromic acid, nickel chloride, and copper cyanide. Peninsula Plating closed shortly thereafter following a history of non-compliance with industrial waste discharge permits and Emergency Planning and Community-Right-to-Know Act (EPCRA) requirements. DNREC Emergency Response and Enforcement Branches informed the EPA Region III Emergency Response Team (ERT) of the former plating building that contained numerous vats, tanks, drums, and containers of hazardous materials.

EPA's ERT conducted a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action at the abandoned Peninsula Plating facility in mid to late 1995. The removal action included the removal of seventy-eight 55-gallon drums of hazardous waste and 30 cubic yards of hazardous solids, including flammable and corrosive liquids, oxidizers, and liquids contaminated with cadmium and chromium (Ten Bears, 2015).

DNREC performed an SI at Peninsula Plating in 1999. Samples collected during the SI included:

- Shallow (surface to 2 feet bgs and deep (up to 8 feet bgs or groundwater) soil samples collected from test pits (28 total soil samples).
- Groundwater samples from three groundwater monitoring wells.
- Water sample from one Town of Blades public well.

Samples were submitted to an environmental laboratory for analysis based on field screening results. Analyzed samples included:

- Four shallow test pit soil samples.
- One deep test pit soil sample.
- Two surface soil samples.
- Three groundwater samples from groundwater monitoring wells.
- One water sample from the Town of Blades public well.

Soil samples were analyzed for semivolatile organic compounds (SVOCs), with the exception of one soil sample, SS-1. Select soil samples were also analyzed for volatile organic compounds (VOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and cyanide. Groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and cyanide. The conclusions presented in the SI are as follows:

- Iron, manganese, and aluminum were detected in soil at elevated concentrations, but no concentrations exceeded EPA risk-based criteria (RBC) or Delaware Hazardous Substance Cleanup Act (HSCA) Uniform Risk-Based Standards (URS).
- Organic constituents were not detected in groundwater at concentrations exceeding the RBC Tap Water, URS Groundwater, or Drinking Water MCL.

- Field screening of soil samples using immunoassay test kits for PCBs, polynuclear aromatic hydrocarbons (PAHs), and pesticides and using an X-ray fluorescence (XRF) instrument for metals indicated elevated concentrations of arsenic, chromium, iron, manganese, vanadium, thallium, and zinc. Elevated arsenic concentrations were detected in soil samples submitted for analysis. PAHs were also detected in soil samples submitted for laboratory analysis at concentrations exceeding RBC and URS benchmarks.
- As part of an ongoing file review, EPA also noted that Peninsula Plating had used the same plating processes as Procino Plating; however, the wetting agent used is unknown at the time this FSP was prepared.

2.2.3 RESIDENTIAL WELL SAMPLING

In spring 2018, WESTON collected residential well water samples for PFAS analysis at residences located within Blades or northeast and west of the town. Most Blades residences are supplied with public water, but residences outside the town limits are served by residential wells. PFAS concentrations exceeded EPA Health Advisory Levels (HALs) of 70 parts per trillion (ppt) for PFOS, PFOA, or the sum of PFOS and PFOA concentrations in six of the residential wells located west of Blades. Locations of the residential wells sampled and the PFAS concentrations detected during the residential well sampling event are shown on Figure 3.

3.0 OBJECTIVE OF SAMPLING

An SI will be conducted that will include groundwater, surface water, sediment and soil sampling at the two plating facilities to confirm or deny the presence of contamination to help determine whether there is a continued off-site threat to any exposure pathway. The SI data will be incorporated into a preliminary Hazard Ranking System (HRS) score, which will be calculated to document if the Site has an exposure pathway that would score and would qualify for placement on the National Priorities List (NPL). This Field Sampling Plan (FSP) provides a description of the field activities related to this sampling event. WESTON developed the FSP in accordance with the provisions of the *Final Uniform Federal Policy Program Quality Assurance Project Plan (UFP-QAPP), EPA Region III Superfund Technical Assessment and Response Team 5 (START-5 Contract)* (WESTON, 2015a).

4.0 PROPOSED ACTIVITIES

This section describes the scope of work, including proposed sampling activities and field measurements; summarizes samples for the project; explains how samples will be collected and handled; and describes equipment decontamination procedures and the disposal of investigation-derived waste (IDW) generated during sampling.

4.1 SCOPE OF WORK

As part of the SI, WESTON will perform the following tasks:

- Install up to 18 groundwater monitoring wells at nine locations.
    - New wells will monitor three general depth intervals:
        - Shallow interval to a depth of approximately 20 feet bgs screened above the upper clay layer.
        - Intermediate interval to a depth of approximately 45 feet bgs screened below the upper clay layer identified in previous investigations.
        - Deep interval to a depth of approximately 75 feet bgs screened below the lower clay layer identified in previous investigations.
    - New well locations and configurations will include the following:
        - Two clustered or nested well pairs, each consisting of one shallow and one intermediate well, in two background locations (total four wells).
        - Six downgradient clustered or nested well pairs, each consisting of one shallow and one intermediate well (total 12 wells).
        - One deep upgradient well and one downgradient deep well (total two wells).
        - Wells will be constructed of 2-inch diameter Schedule 40 PVC flush-threaded risers and 2-inch diameter, 10-foot sections of PVC machine-slotted (10-slot) wells screen and bottom cap. No glue or adhesive will be used in construction of the wells. Wells will be completed with flush-mount, bolt-down surface completions secured in concrete pads.
        - Teflon® products will not be used during well installation as they may contain PFAS.

- Screens will be surrounded by clean filters sand appropriately sized for 10-slot screens.
- Wells will be installed using direct push technology (DPT) or hollow stem auger (HSA) drilling methods. Soil cuttings, if generated, will be containerized for staging, characterization, and off-site disposal. WESTON understands that IDW can be staged on the former Peninsula Plating property.
- If wells are installed as nested pairs (i.e. two wells in one borehole), 2 feet of filter sand shall be emplaced above the lower screen, overlain by at least 5 feet of bentonite pellets. The upper screen shall have at least 1 foot of sand emplaced below the screen and 2 feet of sand above the screen.
- Upper sand packs shall be overlain by 2 feet of bentonite pellets, which shall be allowed to hydrate before grout is emplaced.
- The annular space for all wells shall be sealed by grouting from the top of the upper bentonite seal to the surface using Portland cement grout.
- All wells will be developed until pH, temperature, and specific conductance stabilize. Development water will be containerized for staging, characterization, and off-site disposal.

* Collect up to 18 groundwater samples from newly installed permanent groundwater monitoring wells and up to 14 groundwater samples from existing groundwater monitoring wells. Samples will be collected for PFAS and metals, including mercury, hexavalent chromium, cyanide, and pesticides.

* Collect up to nine surface water samples from the Nanticoke River and its tributary, including two upgradient locations. Samples will be collected for PFAS and metals, including mercury, hexavalent chromium, cyanide, and pesticides.

* Collect up to nine sediment samples from the Nanticoke River and its tributary, including two upgradient locations. Samples will be collected for PFAS and metals, including mercury, hexavalent chromium, cyanide, and pesticides.

* Collect up to four soil samples for PFAS only from soil cores collected during groundwater monitoring well installation. At two locations, one soil sample will be collected from the upper 2 feet starting at ground surface, and another soil sample will be collected from the 2-foot interval immediately above the water table.

- Collect two field duplicate samples for groundwater and one field duplicate sample each for surface water, soil, and sediment.
- Collect one rinsate blank per day for each type of non-dedicated sampling equipment.
- Collect one field reagent blank (FRB) for PFAS per day (associated only with groundwater or surface water samples).
- Document and record sample locations using Global Positioning System (GPS) technology and enter sample location information into a Scribe database.
- Photodocument sampling activities and sampling locations.
- Package and ship all samples collected to the assigned EPA Contract Laboratory Program (CLP) laboratory or Tier IV laboratory (i.e., WESTON-subcontracted laboratory) for the following analyses: PFAS, Full Target Analyte List (TAL) metals, hexavalent chromium, cyanide, and pesticides.

Proposed groundwater sample locations, including existing well locations and proposed locations, are shown on Figure 4. Proposed surface water and sediment locations are shown on Figure 5.

4.2 SAMPLE COLLECTION

Samples will be collected for groundwater, surface water, soil, and sediment. The sampling team will use appropriate hand washing procedures and don clean nitrile gloves when handling bottleware during sample collection to reduce the possibility of sample contamination from common sources of PFAS, such as waterproof or stain-resistant clothing, aluminum, food packaging, and certain foods and beverages, and other precautions as specified in WESTON SOP 201a (2018). A new, clean set of nitrile gloves will be donned prior to collection of the PFAS samples at each sample location in accordance with the sample collection methods described in EPA Method 537 (EPA, 2009). The sample team will not wear stain-resistant or treated clothing during the sample collection process or use Post-It notes or waterproof logbooks while sampling. Water-resistant sample identification tags will not be used on samples that will be analyzed for PFAS.

Samples for PFAS analysis will be collected first in laboratory-provided, high-density polyethylene (HDPE) bottles and will be collected prior to opening pesticide sample containers that may have Teflon-lined lids. PFAS sample containers will be sealed and placed in a separate location from sample containers for other analyses.

4.2.1 GROUNDWATER SAMPLING

Groundwater samples will be collected from up to 18 proposed groundwater monitoring wells and up to 14 existing groundwater monitoring wells. The existing groundwater monitoring wells are one inch in diameter and range in depth from approximately 18 to 37 feet bgs. The proposed groundwater monitoring wells are expected to be 2 inches in diameter with depths up to 100 feet bgs. WESTON will collect groundwater samples in accordance with WESTON SOP No. 201a, Groundwater Sampling for Perfluorinated Compounds (PFCs) (WESTON, 2018) and with EPA Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA, 1996a).

Groundwater monitoring wells will be purged, and groundwater samples will be collected using a peristaltic pump or decontaminated stainless steel submersible bladder pump. Dedicated sample tubing and bladders will be composed of high-density polyethylene (HDPE). Tubing will be discarded after the well is sampled, and the bladders will be replaced between samples. The pump will be decontaminated using a phosphate-free detergent such Liquinox detergent followed by a rinse with PFAS-free water obtained from the laboratory that analyzes the PFAS samples. Wells will be purged using low-flow purge and sample methodology, while temperature, pH, specific conductance, dissolved oxygen, oxidation-reduction potential, and turbidity will be monitored using a calibrated multi-parameter water quality meter installed in a flow-through cell.

Once stabilization is achieved, the flow-through cell will be removed from the equipment chain, and the sample water will be collected directly from the pump discharge sample tubing. Depth to water will also be monitored using a decontaminated electronic water level probe. Once stabilization is achieved, samples will be collected for PFAS and total TAL metals, including mercury, hexavalent chromium, cyanide, and pesticides. Table 1, Analytical Parameters, Containers, and Holding Times Table, which summarizes the analyses, analytical methods, containers, preservatives, quality assurance/quality

control (QA/QC) samples, and technical holding times for the samples proposed for collection during the sampling event, is attached.

4.2.2 SOIL SAMPLING

Two soil samples will be collected from the two deep groundwater monitoring well installation locations (total four soil samples) during the well installation process. At each location, one soil sample will be collected from the 0- to 2-foot bgs depth interval and a second sample will be collected from the 2-foot interval above the water table. Samples will be recovered using a stainless steel core barrel fitted with an acetate liner or stainless steel split spoon. The sample collected from the 0- to 2-foot bgs depth interval may also be collected using a stainless steel hand auger if a hand auger is used for soft dig utility clearance. WESTON will collect soil samples in accordance with WESTON SOP No. 302, Surface Soil Sampling (WESTON, 2015b) and WESTON SOP No. 304, Subsurface Soil Sampling (WESTON, 2015c), with special precautions for PFAS sampling as noted in WESTON SOP 201a.

Soil samples will be analyzed for PFAS. Table 1, Analytical Parameters, Containers, and Holding Times Table, which summarizes the analyses, analytical methods, containers, preservatives, QA/QC samples, and technical holding times for the samples proposed for collection during the sampling event, is attached.

4.2.3 SURFACE WATER SAMPLING

Surface water samples will be collected from up to nine locations along the Nanticoke River and its tributary, including two upgradient locations. WESTON will collect surface water samples in accordance with WESTON SOP No. 203, Surface Water Sampling (WESTON, 2015d) with special precautions for PFAS sampling as noted in WESTON SOP 201a. Surface water sampling will begin at the farthest downstream location and will proceed upstream. Where access allows, the direct fill method will be used to collect samples. In those cases, sample bottles will be dipped directly into the river or tributary to collect the sample. Where access is restricted or for analytes with pre-preserved containers, a dip or swing sampler will be used to retrieve the sample from the river or tributary. If a dip sampler is used, it will be a new, unused sampling device or will have been decontaminated using Liquinox detergent followed by a distilled water rinse before use. Field parameters will be measured at each

surface water sampling location using a calibrated water quality multi-parameter meter for, at a minimum, dissolved oxygen, pH, and temperature.

Surface water samples will be collected for PFAS and total TAL metals, including mercury, hexavalent chromium, cyanide, and pesticides. Table 1, Analytical Parameters, Containers, and Holding Times Table, which summarizes the analyses, analytical methods, containers, preservatives, QA/QC samples, and technical holding times for the samples proposed for collection during the sampling event, is attached.

4.2.4 SEDIMENT SAMPLING

Sediment samples will be collected from up to nine locations along the Nanticoke River and its tributary, including two upgradient locations. The sediment samples will be collected from the same locations as the surface water samples described above. The sediment will be collected near the water-sediment interface from the shore or near the shore. At each location, the surface water sample will be collected before the sediment sample to minimize sediment disturbance.

WESTON will collect sediment samples in accordance with WESTON SOP No. 303, Sediment Sampling (WESTON, 2015e), using special precautions for PFAS sampling as described in WESTON SOP 201a. The sediment will be collected using disposable plastic scoops and transferred to sample containers.

Sediment samples will be collected for PFAS and TAL metals, including mercury, hexavalent chromium, cyanide, and pesticides. Table 1, Analytical Parameters, Containers, and Holding Times Table, which summarizes the analyses, analytical methods, containers, preservatives, QA/QC samples, and technical holding times for the samples proposed for collection during the sampling event, is attached.

4.3 SAMPLE IDENTIFICATION

The Sample Identifier will be listed on the chain-of-custody document for each groundwater sample and will provide the date and sample location as follows:

BDE-MW-XX

The "BDE" prefix refers to the site name (Blades, Delaware). The XX portion of the Sample Identifier refers to the groundwater monitoring well ID (e.g., MW-01).

The Sample Identifier will be listed on the chain-of-custody document for each soil, sediment, and surface water sample and will provide the date and sample location as follows:

BDE-XX-ZZ

The "BDE" prefix refers to the site name (Blades, Delaware). The XX refers to the sample media (i.e., "GW" for groundwater, "SW" for surface water, "SD for sediment, "SO" for soil, "RB" for rinsate blank, and "FRB" for field reagent blank). The "ZZ" refers to the unique sequential numeric ID number assigned to each sample location (surface water and sediment samples will be co-located). Field duplicate samples will be identified by adding a "-D" suffix to the Sample Identifier.

In addition to the Sample Identifier, samples to be shipped to CLP or Delivery of Analytical Services (DAS) laboratories for analysis will be assigned unique CLP sample numbers. Organic samples will be identified in the format C#### (where the # may represent a number or letter), and the corresponding inorganic CLP sample numbers will be in the format MC####. The CLP sample number and the Sample Identifier will be included on the chain-of-custody, the bottle labels, and the sample tags attached to each bottle. Water-resistant sample tags will not be used on samples that will be analyzed for PFAS.

4.4 SAMPLE MANAGEMENT

WESTON will document field activities using logbooks, photographic records, and chain-of-custody documentation. Documentation, record keeping, and data management activities will be conducted in accordance with the WESTON UFP-QAPP (WESTON, 2015a) and in accordance with the *Sampler's Guide: Contract Laboratory Program Guidance for Field Samplers* (EPA, 2014a), unless otherwise specified. Each sampling location will be noted in the field logbook in accordance with WESTON SOP No. 101, Logbook Documentation (WESTON, 2015f). Scribe software will be used for sample documentation and data management.

Sample handling, packaging, and shipment procedures will be in accordance with the *Sampler's Guide: Contract Laboratory Program Guidance for Field Samplers* (EPA, 2014a) for samples shipped to CLP or DAS laboratories, or *Sample Submission Procedures for the Office of Analytical Services and*

Quality Assurance (OASQA) Laboratory Branch (EPA, 2014b) for samples sent to the EPA Region III Environmental Science Center Laboratory Branch at Fort Meade, MD. Sample labels and tags will be affixed to each sample bottle or jar shipped to the CLP or DAS laboratory. Samples will be placed in plastic zipper bags. Bagged containers will be placed in coolers with separately bagged ice. All sample documents will be sealed in a plastic zipper bag and affixed to the underside of each cooler lid. The lid will be sealed with shipping tape, and custody seals will be affixed to the cooler. Coolers will be labeled with the origin and destination locations.

Chain-of-custody documents will be completed using Scribe software and will accompany field samples to the laboratory in accordance with WESTON SOP No. 103, Chain-of-Custody Documentation (WESTON, 2016a). Samples will be shipped to the designated CLP laboratories via Federal Express. Regulations for packaging, marking, labeling, and shipping hazardous materials and wastes are promulgated by the U.S. Department of Transportation. Air carriers that transport hazardous materials require compliance with the current International Air Transport Association (IATA) regulations, which apply to shipment and transport of hazardous materials by air carrier. WESTON will follow all applicable IATA regulations.

4.5 DECONTAMINATION AND INVESTIGATION-DERIVED WASTE

Dedicated, disposable sampling equipment and personal protective equipment (PPE) will be used wherever applicable. Disposable sampling equipment and PPE will be double-bagged and disposed of as dry industrial waste. Non-dedicated sampling equipment, such as submersible bladder pumps, will undergo a gross decontamination between each sampling point with a phosphate free detergent such as Liquinox detergent followed by a double rinse with distilled water, in accordance with WESTON SOP No. 301, Decontamination Procedures (WESTON, 2015g).

IDW is defined as any byproduct of the field activities that is suspected or known to be contaminated with hazardous substances. IDW for this sampling event will consist of purge water pumped from groundwater monitoring wells. IDW will be handled in accordance with Office of Land and Emergency Management (OLEM), formerly Office of Solid Waste and Emergency Response (OSWER) 9345.3-02 and WESTON SOP No. 019, Investigative Derived Waste Compliance Plan (WESTON, 2016b).

5.0 ANALYTICAL PARAMETERS AND METHODS

Samples will be analyzed for PFAS, cyanide, pesticides, and total TAL metals, including mercury. Analysis will be conducted in accordance with EPA CLP Methods SOM02.4 and ISM02.4 for organics and inorganics, respectively (EPA, 2017a and EPA, 2017b). Hexavalent chromium will be determined in groundwater and surface water samples by EPA Method 218.7 (EPA, 2011). For sediment samples, the sediment will be extracted using the alkaline digestion procedure for hexavalent chromium (EPA 3060A), and the extract will be analyzed by EPA Method 7196A (EPA, 1996b and EPA, 1992, respectively). PFAS samples will be collected and analyzed by Modified EPA Method 537 Version 1.1 (EPA, 2009). PFAS analytes will include the following:

- Perfluorooctanesulfonic acid (PFOS).
- Perfluorooctanoic acid (PFOA).
- Perfluorononanoic acid (PFNA).
- Perfluorohexanesulfonic acid (PFHxS).
- Perfluoroheptanoic acid (PFHpA).
- Perfluorobutanesulfonic acid (PFBS).

Table 1, Analytical Parameters, Containers, and Holding Times Table, which summarizes the analyses, analytical methods, containers, preservatives, QA/QC samples, and technical holding times for the samples proposed for collection during the sampling event, is attached.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

This section describes the QA and QC procedures for personnel during the site sampling event, including responsibilities, field QC, laboratory QC, data evaluation, and data management.

6.1 FIELD QUALITY CONTROL

Field QA/QC measures will consist of collecting field duplicates and field blanks (e.g., ambient field reagent blank samples [for PFAS only] and equipment rinsate blank samples). These measures will be applied in accordance with the WESTON UFP-QAPP (WESTON, 2015a). The number and types of QC samples to be collected are summarized in the Table 1.

Field duplicate samples will be collected at a rate of one per 20 samples per sample matrix and will be used to test the reproducibility of sampling procedures and analytical results.

Equipment rinsate blanks will be collected from non-dedicated sampling equipment at a frequency of one per day or one per 20 samples per matrix for each sampling equipment type for each parameter to be analyzed, whichever is more frequent. Equipment blank results will be used to verify proper decontamination of non-dedicated sampling equipment. WESTON will obtain PFAS-free water from the laboratory performing the PFAS analysis for use as the PFAS rinsate blank. Deionized (DI) water will be used for the rinsate blank for pesticides, cyanide, and TAL metals, including mercury. The Tier IV laboratory will provide the water to generate the rinsate blank for hexavalent chromium.

Ambient FRBs will be collected at one groundwater or surface water sampling location per day by transferring PFAS-free water provided by the PFAS laboratory to a clean sample container. Ambient FRB results will be used to assess whether ambient contamination may be present that may impact sample results. No PFAS FRBs will be collected in association with soil or sediment samples.

Temperature blanks will be placed in each sample cooler and used to determine whether samples have been adequately cooled during shipment and storage. The temperature blank will be prepared using tap water placed in a watertight bottle or vial without preservative.

6.2 LABORATORY QUALITY CONTROL

Samples will be shipped to the EPA Region III Environmental Science Center Laboratory Branch located in Fort Meade, MD, or to the CLP laboratory assigned through the EPA Region III OASQA, or to the assigned Tier IV DAS laboratory. Laboratory QC measures will consist of all QC elements identified in the analytical method or CLP Statement of Work (SOW), as required by EPA Region III policy, and will incorporate all reportable QC (including forms and deliverables) required by the SOW and this FSP.

Matrix spike/matrix spike duplicate (MS/MSD) and matrix spike/duplicate (S/D) sample results are used to assess analytical precision and accuracy in a specific sample matrix. WESTON field personnel will collect a minimum of one MS/MSD for organics (pesticides and PFAS) and one S/D sample for inorganics (cyanide and TAL metals, including mercury, and hexavalent chromium) per 20 samples of

the same matrix. For water samples, the MS/MSD sample will require collection of a triple volume of sample, and the analysis for the S/D sample will involve the collection of a double volume of sample. Additional sample volume is not required for the soil and sediment samples. The laboratory performing hexavalent chromium in sediment samples will be required to perform a pre-digestion matrix spike and a post-digestion matrix spike in accordance with EPA Method 3060A. See Table 1, Analytical Parameters, Containers, and Holding Times Table, for a summary of QA/QC samples being collected.

6.3 DATA VALIDATION

Validation of all analytical data will be performed by the Environmental Services Assistance Team (ESAT) contractor under the direction of the OASQA Branch. Organic data will be validated at the Organic Level 2 level in accordance with EPA *National Functional Guidelines for Organic Superfund Methods Data Review (SOM02.4)*, EPA-540-R-2017-002 (EPA, 2017c). Inorganic data will be validated at the Inorganic Level 2 level in accordance with EPA *National Functional Guidelines for Inorganic Superfund Methods Data Review (ISM02.4)*, EPA-540-R-2017-001 (EPA, 2017d).

6.4 DATA EVALUATION AND MANAGEMENT

This section describes how WESTON will evaluate data generated from the sampling event, determine whether data are representative of the Site, and make certain that data are secure and retrievable.

6.4.1 DATA EVALUATION

WESTON will review the data validation reports to determine whether any major or minor deficiencies were encountered during sampling and analysis. These deficiencies may include major deficiencies (such as unusable or rejected data) or minor deficiencies affecting data, including data that were estimated or qualified due to the failure to meet project-specific or National Functional Guideline QC acceptance limits.

To assess the effectiveness of field sampling procedures and implement corrective actions as needed, WESTON will evaluate field blank results. Rinsate blank contamination, not otherwise attributed to laboratory sources, may be due to inadequate decontamination procedures or contamination in source water used for the rinsate blank. FRB contamination, not otherwise attributed to laboratory sources, may be due to ambient field contamination present during sampling or to source water used for the

FRB. Failure of the temperature blank to meet the temperature acceptance criteria indicates the need to better ice down the samples.

6.4.2 DATA REPRESENTATIVENESS AND COMPLETENESS

The intent of this FSP is to obtain a complete data set that is representative of site conditions. Data will be reviewed for completeness. If not all samples were collected, resulting in less than 100% completeness, the reason for the data gaps will be identified in the SI Report. If any data are rejected, the reason for the data rejection will be discussed in the SI Report. If sampling activities or procedures vary significantly from this FSP due to unexpected conditions in the field or other unforeseeable factors, WESTON will discuss in the SI Report these deviations from the FSP and whether the changes affect data representativeness.

6.4.3 DATA MANAGEMENT

EPA Region III will provide WESTON with a validation report for the analytical data in portable document file (PDF) format along with an importable Excel electronic data deliverable (EDD). WESTON will upload the EDD data to the Scribe database and compare the EDD results to the sample results received in pdf format in conjunction with the data validation report to ensure their consistency. All electronic data will be stored in a Scribe database for future retrieval and reference, based on the Work Assignment Manager (WAM) requirements.

7.0 SCHEDULE AND DELIVERABLES

WESTON anticipates that sample collection will take place in September and October 2018. WESTON will ship samples to the assigned laboratory for analysis. WESTON expects to receive validated analytical data from EPA Region III approximately 35 days after the laboratory receives the samples. WESTON will provide EPA with the SI Report within 60 days after all site activities have been completed and validated data are available.

Information obtained during the sampling event will be compiled into an SI Report. The SI Report will discuss data collection methods and document sampling locations and include data summary tables, figures, maps, and site photographic documentation.

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TABLE

Table 1
Analytical Parameters, Containers and Holding Times Table

Matrix	Parameter	Analytical Method	Container Type	Preservative[1]	Detection Limit	Technical Holding Time	Number of Field Samples	Number of. Field Duplicates	Number of Designated Lab QC Samples[2]
Groundwater	PFAS	Modified EPA 537	2-250 mL HDPE	Ice	Lab RLs	7 days	32	2	2 MS/MSD
	Pesticides	CLP SOW SOM02.4	Two 1-L amber	Ice	CRQL	7 days to extract / 40 days to analyze	32	2	2 MS/MSD
	Total TAL Metals including Hg	CLP SOW ISM02.4 ICP-MS	1-L HDPE	HNO_3 to pH <2, Ice	CRQL	180 days (28 days for Hg)	32	2	2 S/D
	Hexavalent Chromium	EPA 218.7	1-250 mL HDPE	Na_2CO_3, $NaHCO_3$, $(NH_4)_2SO_4$ to pH >8, Ice	Lab RL	14 days	32	2	2 S/D
	Cyanide	CLP SOW ISM02.4	1-L HDPE	NaOH to pH >12, Ice	CRQL	14 days	32	2	2 S/D
Surface Water	PFAS	Modified EPA 537	2-250 mL HDPE	Ice	Lab RLs	7 days	9	1	1 MS/MSD
	Pesticides	CLP SOW SOM02.4	Two 1-L amber	Ice	CRQL	7 days to extract / 40 days to analyze	9	1	1 MS/MSD
	Total TAL Metals including Hg	CLP SOW ISM02.4 ICP-MS	1-L HDPE	HNO_3 to pH <2, Ice	CRQL	180 days (28 days for Hg)	9	1	1 S/D
	Hexavalent Chromium	EPA 218.7	1-250 mL HDPE	Na_2CO_3, $NaHCO_3$, $(NH_4)_2SO_4$ to pH >8, Ice	Lab RL	14 days	9	1	1 S/D
	Cyanide	CLP SOW ISM02.4	1-L HDPE	NaOH to pH >12, Ice	CRQL	14 days	9	1	1 S/D
Sediment	PFAS	Modified EPA 537	1-250 mL HDPE	Ice	Lab RLs	14 days	9	1	1 MS/MSD
	Pesticides	CLP SOW SOM02.4	One 8-oz jar (amber glass)	Ice	CRQL	14 days	9	1	1 MS/MSD

Table 1 Analytical Parameters Table (Continued)

Matrix	Parameter	Analytical Method	Container Type	Preservative[1]	Detection Limit	Technical Holding Time	Number of Field Samples	Number of. Field Duplicates	Number of Designated Lab QC Samples[2]
	TAL Metals including Hg	CLP SOW ISM02.4 ICP-MS	One 8-oz jar	Ice	CRQL	180 days (28 days for Hg)	9	1	1 S/D
	Hexavalent Chromium	EPA 3060A/ EPA 7196A	One 8-oz jar	Ice	Lab RL	30 days to extract / 24 hours to analyze	9	1	1 Pre-Digestion MS 1 Post-Digestion MS 1 Laboratory Duplicate
	Cyanide	CLP SOW ISM02.4	One 8-oz jar	Ice	CRQL	14 days	9	1	1 S/D
Soil	PFAS	Modified EPA 537	1-250 mL HDPE	Ice	Lab RLs	14 days	4	1	1 MS/MSD
Aqueous Blank Samples (FRB, RB)	PFAS	Modified EPA 537	2-250 mL HDPE	Ice	Lab RLs	7 days	1 FRB/day[3] 1 RB/day[3]	0	0
	Pesticides	CLP SOW SOM02.4	Two 1-L amber	Ice	CRQL	7 days to extract / 40 days to analyze	1 RB/day[3]	0	0
	TAL Metals including Hg	CLP SOW ISM02.4 ICP-MS	1-L HDPE	HNO_3 to pH <2, Ice	CRQL	180 days (28 days for Hg)	1 RB/day[3]	0	0
	Hexavalent Chromium	EPA 218.7	1-250 mL HDPE	Na_2CO_3, $NaHCO_3$, $(NH_4)_2SO_4$ to pH >8, Ice	Lab RL	14 days	1 RB/day[3]	0	0
	Cyanide	CLP SOW ISM02.4	1-L HDPE	NaOH to pH >12, Ice	CRQL	14 days	1 RB/day[3]	0	0

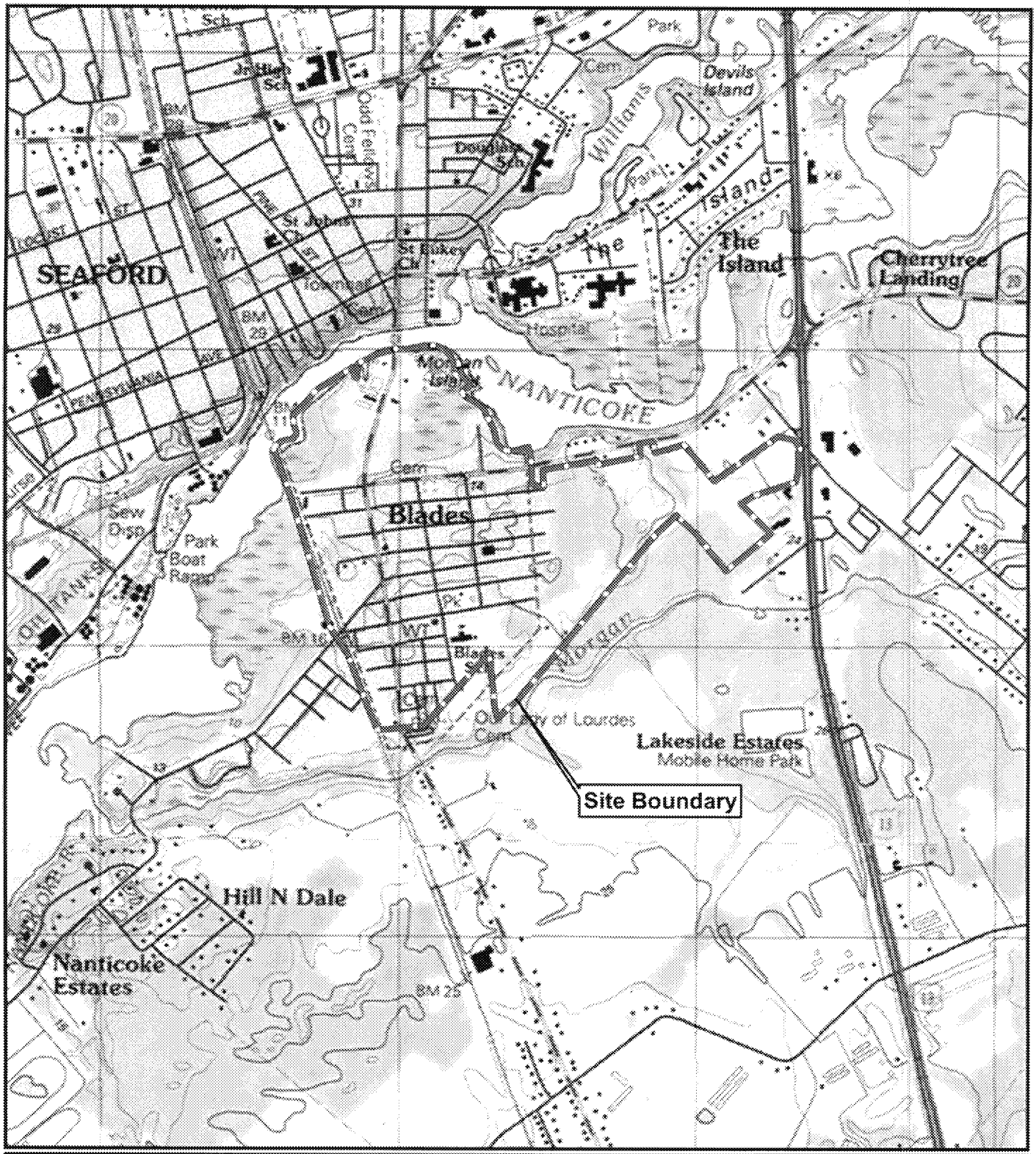
Notes

[1] Groundwater and surface water samples for PFAS analysis will not be preserved with Trizma™ because they will not be chlorinated.

[2] Designate 1 sample per 20 samples for laboratory QC (i.e., MS/MSD for PFAS and pesticide analysis and S/D for inorganic analysis). A triple volume is required for the water PFAS and pesticide samples designated for MS/MSD analysis. Double volume is required for the soil PFAS and sediment PFAS and pesticide samples designated for MS/MSD analysis. Additional sample volume is not required for the sediment inorganic sample designated for S/D analysis.

[3] FRBs will be collected only for PFAS for groundwater and surface water samples. Equipment Rinsate Blanks will only be collected from non-dedicated sampling equipment.

CLP = Contract Laboratory Program
CRQL = Contract-required quantitation limit
EPA = U.S. Environmental Protection Agency
FRB = field reagent blank
HDPE = high-density polyethylene
HNO_3 = nitric acid
ICP-MS = inductively coupled plasma-mass spectroscopy
L = liter
mL = milliliter
MS/MSD = matrix spike/matrix spike duplicate
Na_2CO_3 = sodium carbonate
$NaHCO_3$ = sodium bicarbonate
NaOH = sodium hydroxide
$(NH_4)_2SO_4$ = ammonium sulfate
oz. = ounce
PFAS = polyfluoroalkyl substances
QC = quality control
RB = Equipment Rinsate Blank
RL = Reporting Limit
S/D = matrix spike/duplicate
SOM2.4 = CLP SOW Superfund Organic Method
SOW = Statement of Work
TAL = Target Analyte List



File: Y:\EPA_Region_III\Blades\MXD\Site_Location_USGS.mxd, 7/12/2018 10:41:30 AM, jones

Imagery: ESRI, Bing Mapping Service

Coordinate System:
WGS84 UTM Zone 18N Feet

Blades Groundwater
Blades, Sussex County, DE

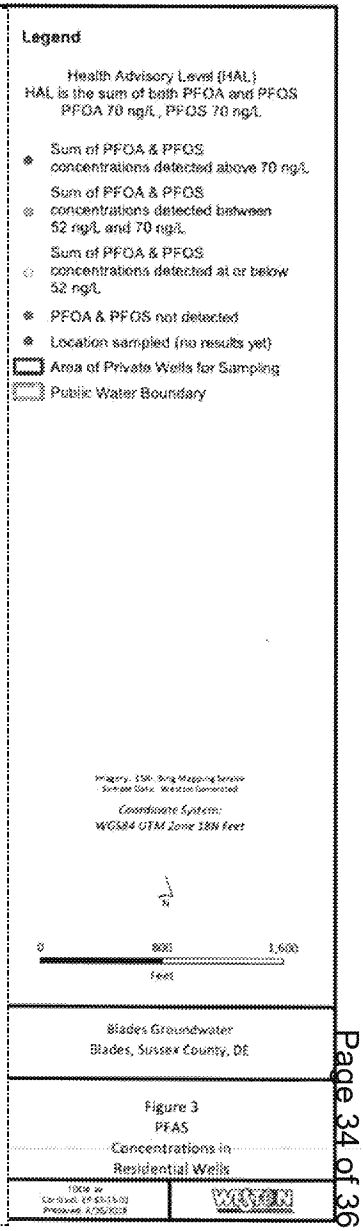
Figure 2
Site Layout Map

TDD#: W
Contract: EP-S3-15-02
Prepared: 7/12/2018

WESTON SOLUTIONS

File: I:\EPA_Region_III\Blades\MXD\Site_Layout_Map.mxd 7/12/2018 10:48:00 AM, jolmie

Ex. 9 Wells & Ex. 6 Personal Privacy




Blades GWS-06/GWI-06
Procino MW-4
Procino MW-3
DNREC-SIRB 0E-0344
Procino MW-6
Procino MW-5
Procino MW-2
Procino MW-13
Deeper Well
Procino MW-7
Blades GWD-06
Procino MW-10
Blades GWD-07/GWS-07
Procino MW-8
Procino DMW-2
Procino MW-9
Procino MW-11
Procino MW-12
Procino DMW-3
Procino MW-15
Procino MW-14
GWS-05, GWD-05
MW-2 (Abandoned)
GWD-01, GWS-01
MW-3
GWS-02/GWD-02
DNREC-SIRB 0E-0282
MW-1 (Abandoned)
GWD-03/GWS-03
GWD-04, GWS-04
GWS-10
GWS-09/GWI-09
GWS-13/GWI-13
GWS-11
GWS-12/GWI-12
Legend
Abandoned Peninsula Plating Groundwater Monitoring Wells
Existing Peninsula Plating Groundwater Monitoring Wells
Existing Procino Groundwater Monitoring Wells
Proposed Blades Groundwater Monitoring Wells
Groundwater Contours
Peninsula Plating
Procino Plating
Coordinate System:
WGS84 UTM Zone 18N Feet
0
245
490
735
980
Feet
Blades Groundwater
Blades, Sussex County, DE
Figure 4
Proposed Groundwater
Monitoring Well Sample Location Map
WSP


Legend
Proposed Sediment and Surface Water Sample Locations
Creek/Stream
Peninsula Plating
Procino Plating
Nanticoke River
SW-SED-06
SW-SED-05
SW-SED-09
SW-SED-07
SW-SED-04
SW-SED-03
Morgan Branch
SW-SED-02
SW-SED-01
Coordinate System:
WGS84 UTM Zone 18N Feet
0
200
400
600
800
Feet
Blades Groundwater
Blades, Sussex County, DE
Figure 5
Proposed Surface Water
and Sediment Sample Location Map